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Purchasing Ground Phosphate Rock

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The use and value of phosphate rock as a fertilizer has been discussed in Circular No. 20 written by Prof. John R. Fain, and published within the last year. This circular is intended to give valuable information which should be made use of by anyone who contemplates the use of raw rock phosphate. No discussion of the use of phosphate rock will be attempted in this article but it is written to call attention to certain facts which must be considered in order to make rational purchases of this material.

The use of rock phosphate is rather new to farmers in this state. Under normal conditions sulphuric acid is very cheap, thus making the manufactured product—acid phosphate—cheap. For this reason acid phosphate in which the phosphoric acid is available has been the chief source of phosphatic fertilizers. Just now, due to war conditions, the price of sulphuric acid is abnormally high, and the raw ground phosphate rock is being advertised and offered to the consumer more than ever before. Agents are visiting farmers and in some cases are making misleading claims for the material. Since the farmer is not accustomed to using raw ground rock he is not fully posted and may believe that he is getting a material of special value for which he may pay entirely too much. That this is true is evident from the many inquiries which are now coming to the College from farmers in different parts of the state.

It must be understood that there is a place for ground phosphate rock in our agriculture in connection with permanent soil building as explained in Circular No. 20 mentioned; but it must be understood that it cannot be substituted for the more available forms of phosphoric acid on most soils in this state in their present con-

dition. Phosphate rock of good quality contains from 28 to 34 percent of total phosphoric acid while acid phosphate contains only about one half as much, and if the phosphoric acid in the two substances were equally available the phosphate rock would be worth twice as much as the acid phosphate, but the chief difference in the value of the two substances is that practically none of the phosphoric acid in phosphate rock is available while practically all of that in acid phosphate is available.

In buying ground phosphate rock from whatever source or under whatever trade name, the purchaser is buying unavailable phosphoric acid and must not be led to believe otherwise by statements claiming special chemical combinations in which the phosphoric acid is more available in phosphate rock from one source than another.

The only hope of any benefit from the use of phosphate rock is that it will become available after it is added to the soil, and whether this takes place or not depends largely upon the condition of the soil and the fineness of the material, and not upon any special kind of phosphate rock.

Sources of Phosphate Rock

Practically all the phosphate rock sold in this state comes from the states of South Carolina, Tennessee and Florida. The material from these different sources vary somewhat in physical appearance and in the percentage of phosphoric acid, but the chemical combination of the phosphoric acid is the same in all cases, it being combined with lime, iron, and alumina. In some cases it occurs mixed with clay and other worthless material. This contamination causes the variation in phosphoric acid content, the more impurities the lower the percentage of phosphoric acid. These impurities may be washed out in many cases, and a very high grade phosphate rock obtained. The rock that contains a high percent of iron and alumina is less valuable than that with a low percent of these constituents. The phosphoric acid combined with iron and alumina is far less soluble and will take a much longer time to become available, if it ever becomes available, than that combined with lime.

The phosphate rock from South Carolina is found in river beds and deposits on land. It is washed free from impurities, has a low percent of iron and alumina and is quite uniform in composition, containing from 26 to 28 percent of phosphoric acid. The phosphate rock from Tennessee is obtained fairly free of impurities with only a small percent of iron and alumina and contains from 30 to 32 percent of phosphoric acid.

The percentage of phosphoric acid is more variable in the Florida material, since it occurs in different physical forms. It appears

as pebbles in river beds as boulders large and small, and as soft rock which resembles clay and is largely contaminated with it. It varies in percentage composition from 18 to 30 percent of phosphoric acid. Having more clay mixed with it, makes it naturally poorer in phosphoric acid. The percentage of iron and alumina is also somewhat higher in this grade of rock.

Some of the ground phosphate rock may contain a small quantity of limestone or carbonate of lime, but it is so small that it is of no practical value for the purpose for which limestone is used, and should not be considered in fixing the price of phosphate rock. The claim is sometimes made that the phosphate rock contains lime and phosphoric acid in combination and that its application serves the double purpose of supplying both lime and phosphoric acid which most soils need. The lime combined with phosphoric acid in rock phosphate, is no more available than the phosphoric acid and it does not answer the purposes of improving the physical condition of the soil and correcting acidity, as limestone, burnt lime, or slaked lime does.

Therefore, in determining the relative values of the different phosphate rocks offered for sale under the names, "floats," "phos-lime" and other trade names and arriving at the price to be paid for same, bear in mind the following facts: 1. That in all cases unavailable phosphoric acid is being purchased. 2. That the phosphoric acid in the raw rock, regardless of its source, is in the same chemical combination being combined with lime, iron and alumina, and the less iron and alumina the better. 3. That the fineness to which it is ground determines the rate at which it becomes available when mixed with the soil. If the fineness is the same and the percent of iron and alumina is low, then the percent of total phosphoric acid alone should determine the price.

In some cases ground phosphate rock is being offered for sale at prices considerably too high, claims being made that it possesses some peculiar property of chemical combination which makes the phosphoric acid more valuable. Often this material is of low grade and cannot be sold for the manufacture of acid phosphate. Therefore, it is put on the market in the raw state with claims that cannot be substantiated, and in order to give weight to these claims the high price is asked. Most of the ground rock put on the market contains from 28 to 32 percent of total phosphoric acid and is ground so that 90 percent will pass through a 100 mesh screen.

At the present time phosphate rock finely ground with a guarantee of 29¾ percent of phosphoric acid, is quoted laid down in Athens from sources in Tennessee at \$6.69 per ton in bulk in paper lined cars.

From another source a finely ground rock containing 32 percent total phosphoric acid is offered at \$4.25 F. O. B. at plant in bulk in paper lined cars. There are no conditions due to the present

war which should affect the price of the raw phosphate rock, and these prices should be fairly stable.

Ascertain in each case the analysis of the products being purchased, on account of the wide variation in the composition of the different rock. It would be well to have a guaranteed analysis of each car. This might increase the cost a few cents per ton but it is better to know just what is purchased.

The following analyses will show the variation in composition of different phosphate rocks:

Sample 1,

Total phosphoric acid-----	34.42 %
Equivalent to bone phosphate of lime-----	(75.20) %
Lime -----	43.07 %
Carbonate of lime-----	6.20 %
Iron and aluminum oxide-----	2.60 %
Sand, etc.-----	6.50 %
Moisture -----	1.65 %
Magnesia, soda, etc.-----	5.65 %

Sample 2,

Total phosphoric acid-----	21.49 %
Equivalent to bone phosphate of lime-----	(46.91) %
Lime -----	28.00 %
Carbonate of lime-----	-----
Iron and aluminum oxide-----	13.50 %
Sand, etc.-----	36.90 %
Moisture -----	1.77 %

It will be seen from the two samples given that there is a difference of approximately 13 percent of total phosphoric acid and that the lower grade has approximately 11 percent more iron and aluminium oxide than the higher grade. The freight rate will be just as much on the low grade material, making it cost the consumer more even if the phosphoric acid in the two materials cost the same.

The other constituents given in the analyses need not be taken into consideration.



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